REMARKS

Applicants assert that the claimed invention is new, non-obvious, and useful. Favorable reconsideration and allowance of the application are respectfully requested in view of the foregoing amendments and following remarks.

Status of the Claims

Claims 1-31 are pending in the application.

Claims 1, 14, 16-18, 24 and 31 have been amended, to more clearly define what the Applicants regard as some embodiments of the invention.

No new matter has been added.

Claim Rejections under 35 U.S.C. § 112, First Paragraph

The Office Action rejected claims 1-17 under 35 U.S.C. §112, First Paragraph, as allegedly failing to comply with the written description requirement. Specifically, the Office Action argued that the phrase "wherein the noise destructive pattern produced by the acoustic transducer has a non-linear relationship to the noise pattern sensed by the acoustic sensor", recited in Claim 1, was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventors had possession of the claimed invention, at the time the invention was made.

Without agreeing with the correctness of the Office Action's argument, the Applicants have amended Claim 1 by deleting the words "produced by the acoustic transducer".

Applicants respectfully submit as follows: (a) Claim 18 recites the phrase: "wherein the noise destructive pattern produced by the controller has a non-linear relationship to the noise pattern sensed by the primary acoustic sensor". (b) The Office Action did not reject Claim 18 under 35 U.S.C. §112, First Paragraph. (c) Therefore, Claim 18 complies with the Written Description requirement. (d) Therefore, Claim 1, as currently amended, which now recites a corresponding feature, similarly complies with the Written Description requirement.

Applicants further submit that the specification as filed includes ample support for the above-mentioned feature recited in Claim 1, as currently amended. For example, the specification discloses (in paragraphs 0031-0032 of the specification as published": "controller 106 **may use non-linear estimation** to estimate the succeeding sample. **Such non-linear estimation may provide**, according to exemplary embodiments of the invention, **a better estimation of the succeeding sample** compared to a corresponding linear estimation. ... Controller 106 may include an estimator 121 **to produce a predicted noise signal 114 by applying an estimation function to one or more samples of noise signal** 103. Speaker 113 may **produce the noise destructive pattern based on predicted noise signal 114"**.

In view of the above, Applicants respectfully request that the rejection of claims 1-17 31 under 35 U.S.C. §112, First Paragraph, be withdrawn.

Claim Rejections under 35 U.S.C. §103(a)

With regard to claims 1-14 and 16-31:

The Office Action rejected claims 1-14 and 16-13 under 35 U.S.C. §103(a) as being unpatentale over Wan, United States Patent Number 5,978,489 ("Wan") in view of Wright, United States Patent Application Publication Number 2003/0103635 ("Wright") and further in view of Klippel et al., United States Patent Number 6,005,952 ("Klippel").

Applicants respectfully submit that Wan and Wright and Klippel, taken individually or in combination, do not disclose or describe all of the features of independent claims 1 and 18, as currently amended, and consequently cannot render obvious claims 1 and 18 or the claims dependent thereon.

The Applicants present herein at least three sets of features of the claimed invention, which are not described or rendered obvious by the combination of Wan and Wright and Klippel.

(A)   Fully-adaptive noise destructive pattern, and fully-adaptive non-linear component.

Independent claim 1, as currently amended, recites, *inter alia*, -
> "**wherein the noise destructive pattern is fully adaptive,**
>
> **wherein the noise destructive pattern comprises a fully adaptive**
>
> **nonlinear component.**"

Corresponding features are recited in independent claim 18, as currently amended.

These features are not disclosed by Wan and/or Wright and/or Klippel.

The Office Action states (on page 4, second paragraph) that "The combined teaching of **Wan and Wright** as a whole, **failed to disclose** of such wherein the noise destructive pattern ... has a **non-linear** relationship to the noise pattern sensed by the acoustic sensor"; and therefore the Office Action had to add **Klippel** to the combination.

However, **Klippel** does not disclose that the above-mentioned features of independent claims 1 and 18, as currently amended; but rather, the system of Klippel is in direct contrast to these claimed features.

Klippel repeatedly describes that its system produces a destructive pattern based on two components: a linear component and a non-linear component; **and that the non-linear component is produced based on static, non-adapted, pre-defined values.**

See: Klippel, at column 9, lines 26-28: "Fig. 9 shows a nonlinear filter 185 which realizes the functions in Eqs (8), (9) and (10) **by using dynamic linear and static nonlinear elements.**"

See also: Klippel, at column 10, lines 19-21: "The output of the filter 246 is also connected both with the inputs of **the static nonlinearity 250** and the differentiator".

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See further: Klippel, at column 10, lines 42-45: "Fig. 14 shows a nonlinear polynomial filter 278 which ... **contains only** dynamic linear and **static nonlinear elements**".

Klippel describes, several times, producing and utilizing non-linear components that are static, explicitly in contrast with Klippel's linear components that are dynamic. Therefore, **Klippel's destructive pattern is not fully adaptive** (because it includes a static non-linear component), and further, **Klippel's destructive pattern does not include a fully-adaptive non-linear component** (but rather, a static non-linear component).

In contrast, the claimed invention produces a noise destructive pattern which includes a fully-adaptive nonlinear component; and the noise destructive pattern, as a whole, is thus also fully adaptive. The specification includes ample support for this feature: for example, Equation 14 discloses the adaption of the linear component; and Equations 15 and 16 disclose the adaption of the non-linear component.

These differences are not merely semantic, but also functional. **The system of Klippel requires a-prior knowledge of the static non-linear component**; whereas the system of the claimed invention does not require such a-prior knowledge, and is able to fully adapt all the parameters in order to generate a fully-adaptive noise destructive pattern.

(B)   Utilization of "virtual" microphone to sense noise at a location having no microphone therein

Claim 14, as currently amended, recites, *inter alia*, -

> **"wherein the estimator is able to estimate a noise error corresponding to an anticipated destructive interference between a pattern of the noise and the noise destructive pattern at a predetermined location, wherein said predetermined location is distinct from a location of said acoustic sensor."**

Corresponding features are recited in claim 24, as currently amended.

These features are not disclosed by Wan and/or Wright and/or Klippel.

These features have ample support in the specification, for example, in paragraph 0027 of the specification as published; as well as in Figure 1 (showing the pre-determined location 112, which is distinct from (and is actually far from) the location of the microphone 102, and also not showing any "wire" or physical connection between the controller 106 or the estimator 121 and the pre-determined location 112.

The prior art does not disclose or teach these features.

Wan and/or **Wright** and/or **Klippel** do not disclose an estimator or a controller to a noise error at a location in which a microphone does not exist.

Wan actually teaches away from the claimed invention, because Wan specifically places a physical microphone 17 inside the area of cancellation 16: see Wan, Figure1, items 16 and 17; see also Wan, column 2, lines 46-53.

Similarly, **Wright** also places its microphones 3a within (or at least, at the beginning of) its quiet region 4. Furthermore, **Wright** describes numerous times how its system uses "measure" or "measures" of the noise by the physical microphones. Additionally, **Wright** again teaches away from the claimed invention, by specifically negating the possibility to estimate the noise at a location not-having a microphone, because it is "impractical": Wright explains, in paragraph 0040, that: "Also **for unpredictable noise** it may be **impractical** to **synthesis the sound, it is therefore measured directly from the primary source using a microphone**, or its equivalent, as previously described."

Klippel, too, utilizes an actually-measured noise by a physical microphone, in order to perform noise cancellation, and does not attempt to estimate a noise at a microphone-less location.

These features of the claimed invention are non-obvious. **First,** the prior art specifically **teaches away** from these features, **by explicitly placing a microphone in the area of cancelation,** and/or **by explicitly relying on actual measurements from a physical microphone** for noise cancellation. **Second,** it is non-obvious to attempt to cancel noise at a

location which does not include a microphone in it. **Third,** only the claimed invention – and not the prior art – is capable of performing noise cancellation **by using a "virtual" microphone,** namely, without using a physical microphone located within the area of cancellation, but rather, by using an estimated noise in that area which is not measured by a physical microphone and is only estimated based on remote acoustic sensing and a set of estimation formulae.

(C)   Multiple microphones correlated to the noise source

Claim 17, as currently amended, recites, *inter alia,* -

> "**wherein said acoustic sensor comprises an array of two or more microphones,**
>
> **wherein the two or more microphones are located in two or more, respective, locations,**
>
> **wherein the two or more microphones are adapted to achieve coherence between the sensed noise pattern and the noise produced by the noise source, by taking into account at least one or more of:**
>
> **geometric structure of a path between said microphones and the noise source;**
>
> **aerodynamic attributes of the path between said microphones and the noise source;**
>
> **surface roughness along the path between said microphones and the noise source;**
>
> **turbulent airflow along the path between said microphones and the noise source;**
>
> **formation of acoustic signals along the path between said microphones and the noise source."**

Corresponding features are recited in claim 31, as currently amended.

These features are not disclosed by Wan and/or Wright and/or Klippel.

These features have **ample support** in the specification, for example, in paragraph 0065 of the specification as published (describing the coherence as dependent on various parameters); in paragraphs 0070-0071 of the specification as published (describing the array of 1 through N microphones, denoted MIC-1 through MIC-21(n)); in Figure 3, showing MIC-1 and MIC-21 as two separate microphones located at two separate locations; in Figure 4, showing MIC-1 and MIC-21 as two separate microphones located at two separate locations; and in other places throughout the specification.

The prior art does not disclose or teach these features.

Wan describes, at most, with reference to item 12 of Figure 1 of Wan, "primary transducer(s) correlated with source". However, Figure 1 of Wan clearly puts the multiple "transducer(s) 12" at the **same location** along the air-path, with a specific arrow pointing to their **single common location** – and not in separate, distinct, location as recited in the claimed invention. Furthermore, Wan does not disclose that due to the existence of two microphones, located at **two different locations**, the system is **adapted to take into account** one or more of the parameters recited in claims 18 and 31.

Wright describes, only twice, that a "series of microphones 3a" may be used, but they are **used only relative to the Secondary Source** (S) which is the Cancelling Speaker, and **not relative to the noise source** (the primary source).

Klippel is **entirely silent** about "microphones": Klippel specifically refers, again and again, to a **single** "microphone" or "input transducer" in singular form, and never in plural form.

Applicants respectfully submit that placing **two or more microphones**, in **two or more respective locations**, such that they **achieve coherence with the single noise source, by taking into account the recited parameters** – is not disclosed by the prior art, and is not obvious in view of the prior art. It is **non-trivial**, and **actually difficult**, to place more than one microphone while achieving coherence with the noise source, since each microphone – once located in a different location – senses a different noise (even if only slightly different).

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These difficulties are particularly valid, and non-obvious, in a system which actively moves air (e.g., using fans) in a non-straight path, as is indeed performed within the housing of computers or servers. The sporadic mentioning of multiple microphones in the prior art is not sufficient: **Wan** places them in a single location 12; while **Wright** uses the multiple microphones 3a only relative to the Secondary Source (the Cancelling Speaker 2a) and not relative to the noise source; and while **Klippel** specifically describes a single microphone.

In view of the above, the combination of Wan and Wright and Klippel does not render obvious independent claims 1 and 18, as currently amended; and further, does not render obvious claims 14 and 24, as well as claims 17 and 31.

Applicants respectfully submit that independent claims 1 and 18 are novel and patentable. In addition, it is respectfully submitted that dependent claims 2-14, 16-17 and 19-31 are likewise novel and patentable at least by virtue of their dependency on amended independent claims 1 or 18.

Applicants respectfully request that the rejection of claims 1-14 and 16-31 under 35 U.S.C. §103(a) be withdrawn.

With regard to claim 15:

The Office Action rejected claim 15 under 35 U.S.C. §103(a) as being allegedly being unpatentale over the combination of Wan and Wright and Klippel and Dance *et al.*, United States Patent Number 6,944,304 ("<u>Dance</u>").

Without agreeing with the appropriateness to combine four references in general, or to combine these four references in particular, the Applicants respectfully submit that the combination of Wan and Wright and Klippel and Dance does not render obvious Claim 15.

The reference of Dance was brought by the Office Action only in order to show a teaching of a "radial basis function", recited in Claim 15. However, claim 15 depends from claim 14, which in turn depends from claim 1. Therefore, claim 15 incorporates by references all the features of claims 14 and 1. Accordingly, the features and arguments discussed above, with regard to claims 1 and 14, apply also to claim 15 – since the fourth reference of Dance fails to cure the deficiencies of Wan, Wright and Klippel.

In view of the above, Applicants respectfully submit that claim 15 is no novel and patentable.
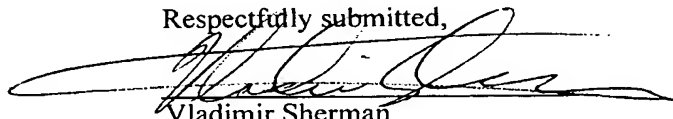
Applicants respectfully request that the rejection of claim 15 under 35 U.S.C. §103(a) be withdrawn.

Conclusion

In view of the foregoing amendment and remarks, the pending claims are deemed to be allowable. Their favorable reconsideration and allowance is respectfully requested.

No fees are believed to be due in connection with this paper. If any fees are in fact due in connection with this paper, please charge any such fees to deposit account No. 50-3400

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